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ENHANCING AGRICULTURE IN AFRICA

A ROLE FOR U.S. DEVELOPMENT ASSISTANCE

SUMMARY

CONGRESS OF THE UNITED STATES OFFICE OF TECHNOLOGY ASSESSMENT

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CONTENTS

	Page
Why Focus on Low-Resource Agriculture?	1
The Status of Low-Resource Agriculture	1
Problems in the Face of Mounting Pressure	7
A Resource-Enhancing Approach to African Agriculture	8
The Role of Technology	11
A Promising Technological Framework	11
Promising Technologies	12
The Role of Foreign Assistance	15
Congress and a Resource-Enhancing Approach	15
Three Categories of Assistance	16
AID and a Resource-Enhancing Approach	18
The Road Ahead	18
Findings and Options	19

Boxes

Box	*Page*
1-1. Faces of Low-Resource Agriculture	2
1-2. African Agroecological Zones and Primary Food Commodities	4
1-3. Building on Low-Resource Agriculture	8

Tables

Table	*Page*
1-1. Low-Resource Agriculture and African Staple Food Production	6
1-2. Promising Technologies and Practices by Agroecological Zone	12
1-3. Findings and Congressional Options for Enhancing Low-Resource Agriculture in Africa	20

Foreword

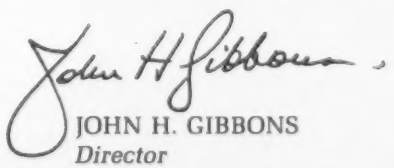
Few African farmers, herders, and fishers have adequate resources to assure continuous food supplies. For them, access to additional resources is vital, along with making the best use of existing capital, information, labor, equipment, etc. On the other hand, most U.S. farmers and ranchers have a larger endowment of resources, including the natural ones upon which agriculture depends ultimately. Nevertheless, increasing numbers of U.S. farmers are choosing to reduce resource use to cut input costs and increase profits. Now, broad interests worldwide seem to be converging on making the most of modest resources. This report examines the situation of African agriculturalists specifically. We anticipate, though, that many of the important lessons learned in Africa will become increasingly relevant to U.S. agriculture.

OTA's Technology Assessment Board, in June 1985, approved requests of three congressional committees and five Board members that OTA examine low-resource agriculture in Africa. OTA published its first results in a 1986 special report[1] that focused on development in the West African Sahel. OTA's first report examined the record of U.S. assistance to nine African nations, explored the lessons learned in a decade of efforts, and suggested policy alternatives to improve the effectiveness of U.S. assistance.

This second report is cast more broadly. OTA has gathered information on agricultural production throughout Sub-Saharan Africa, looked closely at specific, promising technologies such as agroforestry, small-scale irrigation, soil and water management, and the improved use of animals. As a result, it seems clear that low-resource agriculture has a sizable potential to contribute to increased African food security. Also, it is clear that low-resource agriculture must be enhanced in order to reach its full potential. This report identifies ways that U.S. development assistance can aid this process.

The committees that requested this study are: the House Select Committee on Hunger, the House Science and Technology Committee (the Subcommittee on Natural Resources, Agriculture Research, and Environment), and the House Agriculture Committee. Of OTA's 1985 Technology Assessment Board, Senators Hatch, Kennedy, and Pell and Representatives Evans and Udall requested this work. Also, the House Foreign Affairs Committee supported OTA's assessment.

The report draws on the expertise of a large number of people. We appreciate the assistance of our Advisory Panel, the authors of contractor reports, workshop participants, and additional reviewers. Also, we owe a special debt to the Africans who responded to our request for their thoughts and advice on U.S. technical assistance and development policy. Of course, OTA remains responsible for the analysis and the report does not necessarily represent the views of individuals who participated in the study.



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[1] *Continuing the Commitment: Agricultural Development in the Sahel*, OTA-F-308 (Washington, DC: U.S. Government Printing Office, August 1986).

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[1]Resigned as of June 24, 1986.
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[3]Resigned as of Apr. 24, 1986.
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[5]Appointed as of July 16, 1986.
[6]Resigned as of Sept. 26, 1986.
[7]Appointed as of Sept. 27, 1986.

NOTE: OTA gratefully acknowledges the members of this advisory panel for their valuable assistance and thoughtful advice. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of it contents.

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The work was back-breaking. Farmers in the Sahel were carrying rocks, really boulders, on their heads to block gullies and rebuild soil. Their grandparents grew cotton on this land but, after years of erosion, it was rock hard and bare. They came from the village to show us their work, proud of the wire-filled bags of rocks and the smidgins of soil beginning to accumulate around them. One farmer bowed as we met, welcoming visitors who had travelled far to see their efforts, and, maybe, giving us more respect as outside experts than we deserved. "No," one of us responded, "we should bow to you for the work you are doing here."

Notes from an OTA field visit near Ouahigouya
Burkina Faso, November 16, 1986.

Summary and Options

WHY FOCUS ON LOW-RESOURCE AGRICULTURE?

Low-resource agriculture is a form of agriculture practiced by a diverse group of farmers, herders, and fishers that is based primarily on the use of local resources but that may make modest use of external inputs, including information and technology. It is the predominant form of agriculture in Sub-Saharan Africa, and it is the major source of food production, employment, and rural income. Although low-resource agriculture has been the basis for the region's food security[1] in the past, it can no longer meet the continent's increasing needs. Nevertheless, low-resource agriculture has the potential to be improved substantially, and technology and U.S. development assistance can contribute to these changes.

The purpose of this assessment is to examine technologies that show promise to help the heterogeneous group of Africans who practice low-resource agriculture. Also, OTA's goal is to provide Congress with a range of options which, if pursued, would help Africans increase their ability to assure, on a long-term basis, timely, reliable, and nutritionally adequate food supplies.

[1]Food security is a critical goal in Africa. It is "access by all people at all times to enough food for an active, healthy life. Its essential elements are availability of food and ability to acquire it" (*Poverty and Hunger: Issues and Options for Food Security in Developing Countries*, Washington, DC: The World Bank, 1986). This can include dependable, long-term access to food through local production, or through the power to purchase food via local, national, regional, or international markets.

THE STATUS OF LOW-RESOURCE AGRICULTURE

Africa is larger than the United States, western Europe, and China combined, and it is a continent of varied cultures and environments. This diversity is reflected in how agriculture is practiced, so the specific nature of how people farm, herd, or fish varies greatly from place to place and there is no such thing as a "typical" African farm.

Nevertheless, some common elements can be seen in African agriculture. One consistent aspect is its prominent place in African economies. Agriculture employs about three-quarters of Sub-Saharan Africa's labor force and accounts for about one-third the region's gross domestic product. Also, about one-half of the countries in the region derive at least 40 percent of their export earnings from agricultural products. Further, despite major increases in food imports in the last two decades, the region produces a high proportion of its own food—at least 80 percent of cereals, 95 percent of meat, 75 percent of dairy products, and almost all roots and tubers.

More specific similarities in African agriculture can also be found among the large majority of African farming systems that can be termed "low-resource agriculture." Low-resource agriculture is difficult to quantify because use of modern inputs (e.g., commercial fertilizers and hybrid seeds), scale of operation, proportion of crops sold, and income vary widely (box 1-1). The majority of resource-poor farmers and herders are on the lower-to-middle end in the use of these inputs, size of holdings, and cash income, however. Some use virtually no external inputs, earn little money, and produce goods primarily for their own family's consumption. Large-scale commercial ranches and farms that rely up greater amounts of inputs are not considered "low-resource"; such operations probably contribute no more than 5 percent of Africa's food production.

Box 1-1.—Faces of Low-Resource Agriculture

Definitions sometimes do not capture the essence of the activity being defined. Perhaps the best way to understand low-resource agriculture is to imagine how a resource-poor farmer or herder actually lives.*

A Farmer: Sindima is a farmer in Malawi. She is in her late thirties and lives with her five children in an area with relatively good soils and dependable rainfall. Her husband left to find work in the city and she sees him infrequently, so she heads the household, manages the farm, and does almost all the work. She farms about 2½ hectares and is able to feed her family and produce some crops to sell. By local standards, Sindima is affluent. A development assistance program has been active in her village, so she belongs to a farmers' club and has access to the extension agent for information and credit for some fertilizer and improved seeds. With this help, she plants a fairly complicated mix of crops: hybrid and local maize, groundnuts, beans, a little tobacco, and a variety of local vegetables. She uses the hybrid maize and fertilizer on about one-half hectare, but she continues to plant local maize even though it it less productive because it tastes better and is less susceptible to insect damage in storage.

Sindima's fields require heavy labor—with preparation, planting, weeding, and harvesting all timed to keep the land in production as long as the rains last. She also has household responsibilities: caring for the children, grinding maize, gathering firewood, cooking; she even brews a little beer to sell at the market. Her children help—the older girls walk to the well twice each day to get water and help search for firewood—but she can afford to pay their school fees so she encourages them to get an education.

A Nomadic Herder: Mossa is in his forties and has always lived north of Timbukto, Mali, in the vast, dry area of West Africa known as the Sahel. Mossa's nomadic community consists of about 10 related families who move together with their livestock seeking pasture and water. Animals are the core of life for Mossa, his wife, and their seven children. Cattle, sheep, and goats provide milk, butter, cheese, and, for special occasions, meat. Their heavy tents—strong enough to withstand high winds, sand storms, and the driving rain of the wet season—are made of hides, as are their sandals and many household goods. When the family needs grain or other goods, Mossa trades what he must from the herd. Mossa learned to manage his herd from his father, and through trial and error. He has a good understanding of breeding and, while Western veterinary medicine is not generally available, he has a variety of traditional, and often effective, methods to treat his animals. To Mossa and his family the herd is more than a source of income. It is a measure of their status and security. Livestock are their "bank account," their way of saving resources for bad times in a land that has unpredictable but frequent droughts.

Life has changed dramatically for Mossa over the past few years. He has far more contact with other people, and he buys more goods and food. His access to the land is changing, too. Some of the productive lands he once grazed have deteriorated, like in the place where the government dug a deep well and too many animals stripped the land of all vegetation when they came to drink. Crop farmers have taken over other of his traditional lands. During the last drought, Mossa was unable to feed his family and, for the first time had to turn to international organizations for food aid. Mossa has not recovered from that drought, when he lost more than half of his herd. He is uncertain how he will fare if another drought strikes soon.

*Sindima and Mossa are fictional, but these profiles are composites drawn from the lives of real African people.

SOURCES: American Friends Service Committee (AFSC), *Tin Aicha Nomad Village* (Philadelphia, PA: AFSC, 1982); Michael Horowitz, *The Sociology of Pastoralism and African Livestock Projects*, AID Program Evaluation Discussion Paper No. 6 (Washington, DC: Bureau for Program and Policy Coordination, AID, May 1979); George Scharffenburger, Consultant, Washington, DC, personal communication, 1987; Anita Spring, Associate Dean, College of Liberal Arts, University of Florida, Gainesville, personal communication, 1987; and "Profiles of Men and Women Smallholder Farmers in the Lilongwe Rural Development Project, Malawri," report to Office of Women in Development, U.S. Agency for International Development, Washington, DC, March 1984.

Although the agricultural systems that comprise low-resource agriculture are typically complex, diverse, and changing, they generally share these characteristics:

- they strive to minimize risk, even if this means they obtain less than maximum yields;
- they depend on local knowledge;
- they depend on biological processes and renewable resources;
- they involve low cash costs but often require relatively high amounts of labor; and
- they are adapted to local cultures and environments, although social and ecological systems are showing increasing strains under growing pressures.

Agroecological factors, e.g., rainfall patterns, soil types, and animal diseases, also help define low-resource agriculture (box 1-2). Different crops and types of livestock have different relative importance in the Arid and Semi-Arid Tropics, the Subhumid Tropical Uplands, the Humid Lowlands, and the Tropical and Subtropical Highlands. For example, millet and sorghum are the predominant crops in arid and semi-arid regions, largely because of their greater drought tolerance. Maize is grown more commonly in areas with increased rainfall. Roots, tubers, and plantains are the major source of calories in the Humid Lowlands. Similarly, cattle are the dominant livestock in arid and semi-arid, sub-humid, and highland regions, whereas small ruminants—sheep and goats—dominate in humid lowlands because of their greater tolerance to trypanosomiasis.

Notwithstanding these general crop and livestock production patterns, descriptions based on a single commodity create an inaccurate picture of low-resource agriculture. African farming systems tend to be highly diversified, producing a wide array of crops and several types of livestock. Diversified agricultural systems help provide food throughout the year, reduce the risk of crop failure, and modulate peak labor demands.

Low-resource agriculture can be further described by the importance of non-farm activities such as soap-making, crafts, and non-farm wage employment. An estimated 25 to 40 percent of all household labor is devoted to non-farm income producing activities. Farm and non-farm tasks are commonly divided by gender and age, with certain tasks allocated to children and the elderly. Women are the major food producers in most African countries and account for almost half of the agricultural labor force that produces food and non-food crops.

In general, then, low-resource agriculture meets multiple needs for families and requires balancing scarce endowments of land, labor, capital, and other resources. This calls for complex decisionmaking and facing difficult tradeoffs. A greater appreciation exists now of the efficiency and skill of resource-poor farmers and herders, although their agricultural systems were once perceived to be inefficient and haphazard.

In a broader picture, low-resource agriculture is the predominant type of agriculture practiced throughout Africa and it makes a crucial contribution to food security—both the availability of food and the ability to buy it. It is the source of most of Africa's food, a primary income and employment source for the majority of Africans, a source of foreign exchange, and a means used to buffer against food shortfalls and famine by many of Africa's people most vulnerable to poverty.

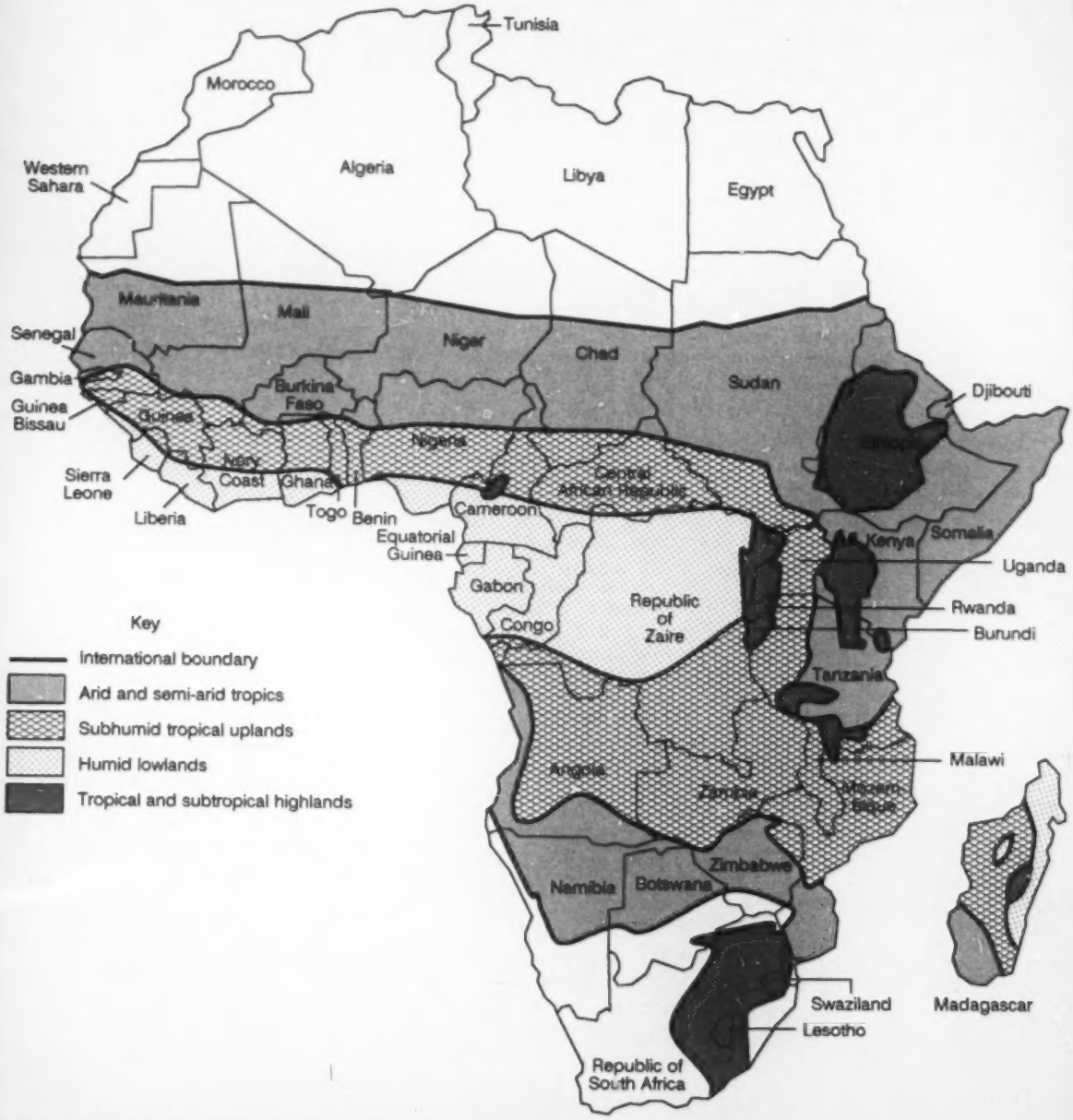
Low-resource agriculture produces the majority of grain; almost all root, tuber, and plaintain crops; and the majority of food legumes (table 1-1). In addition, a great variety of secondary crops, such as fruits and vegetables, are grown under low-resource conditions to supplement these staples. An estimated 74 percent of all livestock are raised on farms where crop production is the primary source of subsistence and livestock are an important source of cash income. And approximately 20 percent of livestock production occurs in pastoral systems, which are low-resource by nature. Fish is a primary source of animal protein for much of Africa. An estimated 85 to 95 percent of African fish harvest is from small-scale operations that do not use expensive equipment or inputs.

Box 1-2.—African Agroecological Zones and Primary Food Commodities

Agroecological zone	Length of growing period[a] (days)	Annual rainfall	Primary food commodities
Arid and Semi-Arid Tropics	1-74 (arid) 75-180 (semi-arid)	100-1,000 mm	Little cultivation in arid areas. Millet and sorghum predominant, with millet grown in drier areas. Maize in wetter areas and rice in river basins. Food legumes (e.g., cowpeas and groundnuts) important and some roots and tubers grown in wetter areas. Approximately 60% of Africa's ruminant livestock (goats, sheep, cattle, and camels) raised here by both nomadic and settled pastoralists.
Subhumid Tropical Uplands	180-270	900-1,500 mm Bimodal rainfall in East Africa	Sorghum and maize are the most important cereals, with sorghum preferred in drier areas. Roots, tubers, and plantains are important. Food legumes and rice also produced. Two-thirds of the zone are affected by trypanosomiasis (spread by the tsetse fly) which inhibits livestock production. N'Dama and Zebu cattle are the economically most important livestock followed by goats and sheep.
Humid Lowlands	270+	1,500+ mm Bimodal rainfall	Roots, tubers, and plantains predominate (e.g., cassava, yams, etc.) Some maize, rice, and sorghum. Trypanosomiasis exists throughout the zone precluding almost all but the small trypano-tolerant N'Dama cattle and tolerant goats and sheep. Some poultry and swine production.
Tropical and Subtropical Highlands	Variable	Variable	Mixed farming (livestock and crops raised on same farm) prevails. Predominant cereals are maize and sorghum. Roots and tubers (especially sweet potatoes) are important in specific countries. Plantains and food legumes are also grown. The absence of trypanosomiasis and availability of good fodder allow a stocking density four times the average.

[a]Length of growing period is the period when both moisture and temperature permit crop growth.

SOURCES: U.S. Agency for International Development, Bureau for Africa, *Plan for Supporting Natural Resources Management in Sub-Saharan Africa*, (Washington, DC: USAID, February 1986). Food and Agriculture Organization of the United Nations, *African Agriculture: The Next 25 Years: Atlas of African Africulture* (Rome, FAO: 1986). International Livestock Center for Africa, *ILCA Annual Report 1983* (Addis Ababa, Ethiopia: ILCA, 1984).



SOURCES: Adapted from U.S. Agency for International Development, *Plan for Supporting Natural Resources Management in Sub-Saharan Africa*, (Washington, D.C.: USAID, February 1987). Zonation for Madagascar from U.N. Food and Agriculture Organization (FAO), *African Agriculture: The Next 25 Years – Atlas of African Agriculture* (Rome: FAO, 1986); International Livestock Center for Africa (ILCA), *ILCA Annual Report 1983* (Addis Ababa, Ethiopia: ILCA, 1983).

Table 1-1.—Low-Resource Agriculture and African Staple Food Production[a]

Crop/livestock/fish	External input use[b]	Minimum estimate of low-resource production[c]
Millet	Virtually no use of fertilizers and very little use of improved seed.	72%
Sorghum	Basically the same situation as millet, but hybrids and commercial inputs are becoming more important in some areas.	61%
Maize	At least 75 percent produced without hybrid seeds and with less than recommended fertilizer levels but probably as much as two-thirds produced with non-hybrid improved seed and moderate levels of fertilizer.	37%
Rice	At least 75 percent produced using less than recommended levels of fertilizer and receiving inadequate irrigation (and no more than 5 percent using High-Yielding Varieties).	76%
Food legumes (e.g., cowpeas, pigeon peas, beans, and groundnuts)	Most crops of this diverse group receive virtually no commercial inputs, but some production is under higher resource conditions (e.g., up to 50 percent of of groundnut production).	55% groundnuts 49% beans
Roots, tubers, and plaintain (e.g., cassava, yam, cocoyam, and sweet potato)	Virtually no use of fertilizers or improved seed. Some high-resource banana production for export.	93% cassava 100% yams 100% cocoyam
Cattle	Six percent produced on ranches, generally considered high-resource; 20 percent produced by pastoralists, virtually all under low-resource conditions except for occasional veterinary care; 74 percent produced in mixed farms, a minority of this under higher resource condition, such as dairy farming in some highland areas.	
Small ruminants and other livestock (e.g., sheep, goats, poultry, and swine)	Almost all sheep, goats, and camels raised under low-resource conditions; most swine and poultry produced under low-resource conditions, but increasingly more produced under higher resource conditions, especially near some urban areas.	
Fish	As much as 85 to 95 percent caught in small-scale artisanal fisheries mostly under low-resource conditions, though increasingly fishers are using outboard motors; the remainder is harvested by large-scale offshore operations mainly by foreign-owned vessels	

[a]Aggregate agricultural data for Africa usually do not detail levels of external input use but only whether or not such inputs are used. This table shows the importance of low-resource production in two ways: first, it describes the type of input use for the production of specific commodities and second, it sets a minimum boundary on the volume of low-resource production of specific crops, based on estimates of "low-input agriculture" production in eight African countries.

[b]Column 2 provides descriptions of the types and levels of external inputs used for specific products. These descriptions help to locate where the majority of production takes place along the range of modern input use. The descriptions were compiled from a set of technology papers written for OTA (app. A) and from additional outside publications.

[c]Column 3 represents an effort to establish quantitative estimates of the minimum contribution of low-resource agriculture. The data show production under conditions of no modern input use for eight sample countries. These eight countries account for at least 50 percent of African production of maize, sorghum, millet, cocoyam, and no less than 30 percent of cassava, groundnut, and rice production. The data were compiled by the Economic Research Service of the U.S. Department of Agriculture for OTA (see app. E).

SOURCE: Office of Technology Assessment, 1988.

A large majority of the estimated three-quarters of Africa's labor force in agriculture is resource-poor. The sale of food and other agricultural products typically accounts for some 60 to 80 percent of the income of rural African producers.

Also, low-resource agriculture makes important contributions to national food security by providing a part of export earnings. A sizable part, perhaps the majority, of export crops are produced by small farmers who simultaneously raise food crops for local use under low-resource conditions. National export earnings are likely to drop when such farmers cannot purchase food reliably and, as a consequence, devote more of their own production to food crops and less to export crops.

Resource-poor agriculturalists commonly face periods of inadequate food availability either during seasonal shortfalls or more irregular famines. Many agricultural practices, such as diversification to decrease the risk of total

crop failure, cassava production, bush collection of wild foods, as well as social means to share food, buffer against these periods of hunger. For example, cassava is known as a "poor person's crop": it is a highly productive staple that grows in low-fertility soils, requires little labor, and can be stored in the ground until hard times come between harvests.

Problems in the Face of Mounting Pressure

African agriculture has continuously and, for the most part, effectively adapted to meet changing conditions. But never before has it had to respond to the level of pressures it currently faces. Paramount is the pressure created by rapidly growing populations and the consequent demands on the land. The African continent has the most rapidly growing population in the world: 2.9 percent per year in 1988. Even if this rate slows slightly as expected, the continent will have triple its current population to feed within just 40 years.

Resulting intensified land use is evident in most regions in reduced fallow periods and, in some areas, falling yields and natural resource degradation. Fallow periods have dropped from 12 years to 2 years or less in Burkina Faso and from 20 years to 5 years in Angola. The shorter fallow periods can reduce yields by as much as 25 to 75 percent, and can increase weeds, soil acidity, and erosion. Many experts anticipate further yield decreases due to land degradation, continued deforestation, especially along the West African coast, and greater fuelwood scarcity.

Per capita food production and income, as well as nutritional levels, are dropping in most areas. From the late 1960s to the late 1970s, Africa changed from a net exporter of staple foods to a net importer. In 1986, the value of exports in 22 countries was not sufficient to pay for imports. Not only is the overall trend to decreasing incomes, it is also one of increasing disparity of income between rich and poor farmers and herders.

Under normal circumstances, low-resource agriculture provides most countries in Sub-Saharan Africa with adequate nourishment. At the same time, its ability to meet African's food needs is declining. This is the only region of the world where the average energy in people's daily diet decreased in the past decade. Although malnutrition generally is not perceived as a pervasive problem except during famine, a significant level of chronic malnutrition exists and as many as 90 percent of the malnourished people are resource-poor agriculturalists.

No doubt low-resource agriculture can do better, but a number of biophysical and socioeconomic constraints exist that retard progress. Generally, African soils are low in fertility and rainfall is unpredictable in many areas and low throughout much of the continent. Consequently, only 16 percent of the total land area is without serious biophysical limitations to agriculture. Also, competition for land between farmers and pastoralists; limitations of labor and capital to invest in agricultural improvements; and infrastructural weaknesses make it difficult to take advantage of new technologies and other improvements. In addition, many national policies have been unsupportive of low-resource agriculture, including the lack of investment in agricultural development and research and development policies that have not addressed the needs of resource-poor farmers and herders.

Lack of investment in agricultural research is among the serious constraints to agricultural intensification. Research expenditures by national governments decreased $80 million between 1980 and 1984, from $465 million to $385 million. Research priorities and methods often do not reflect African realities, for example, women do not receive extension services in proportion to their agricultural contributions, and crops such as cassava are researched less than their prominence in poor people's lives would justify. Many research organizations are plagued by lack of operating funds, low quality facilities, high staff turnover, and few incentives to work with poor farmers and herders.

A RESOURCE-ENHANCING APPROACH TO AFRICAN AGRICULTURE

Despite its constraints, low-resource agriculture is the major food producer and the major employer in most African countries. It is impractical to abandon traditional systems when so many people stand to be adversely affected and when the systems have an untapped potential to be enhanced. This optimism is based on: the central role this type of agriculture already plays, the vast number of people already involved, the economic efficiency apparent on the small-farm sector in Africa, and the significant capacity seen for technical improvements in current agricultural systems. In addition, if low-resource agriculture is ignored it is likely that food security will decrease, bringing unknown social impacts, and environmental degradation will continue, perhaps irreversibly. No viable alternative to low-resource agriculture exists in much of Africa today.

Low-resource agriculture can be enhanced using an approach that builds on the best of existing African agriculture while taking advantage of external inputs, information, and improved techniques (see box 1-3). This, however, presents a great challenge for development assistance—how to pursue an approach that builds on the potential strengths of low-resource agriculture while alleviating the constraints.

From its analysis of low-resource agriculture and how it is practiced in Africa, OTA found four fundamental concepts that provide insight into why low-resource agriculture has been successful in the past and how these potentials might be enhanced in the future. Using these concepts as crucial starting points, OTA developed guidelines that could be used to redirect development assistance to improve its effectiveness:

Concept 1: Most African agricultural systems, although once sustainable, are no longer keeping pace with the increased demands being placed on them. Thus, development assistance should be designed to:

- place a high priority on environmental, economic, social, and institutional sustainability;
- acknowledge the importance of sound natural resource management as a basis for improved and stable agricultural production;
- acknowledge that resource-poor agriculturalists are the primary custodians of their environment and, therefore, ensure that they benefit from development assis-

Box 1-3.—Building on Low-Resource Agriculture

In the 19th century, in the Zinder region of Niger, there was a kind of tree so valuable that the sultan decreed that people found cutting it would lose their heads. Later, in Senegal, the same trees were carefully nurtured as part of a balanced system of crops and livestock. The tree helped maintain continuous cropping of millet in the Sudan for 15 to 20 years in areas where the norm was 3 to 5 years. In each case, the species involved was *Acacia albida*—a fast-growing, leguminous tree native to Africa. It is a species that today is receiving renewed attention from the development assistance community as a way to benefit people and the land.

First, *Acacia* trees are legumes and so fix nitrogen from the air, thus, enriching the soil and improving crop yields. Another advantage is that at the onset of the rainy season the species drops its leaves, providing a leaf mulch that further enriches the topsoil. During this wet season, which is when sorghum and millet are produced, the defoliated canopy permits enough light to penetrate for cereal growth, yet provides enough shading to reduce the effects of the intense heat. During the dry season, the *Acacia's* long taproot draws nutrients from beyond the reach of other plants and stores these in its fruits and leaves. The leaves drop to the ground with the onset of the next rainy season, providing a highly nutritious forage for livestock. The livestock dung, as an added benefit, helps enrich the soil even further. Each of these benefits is important in places where few alternatives exist for improving soil fertility and crop yields.

tance to manage natural resources better; and
- focus on enhancing the capability of Africans to assume primary responsibility for their development as the surest route to sustainability.

Concept 2: Africa's heterogeneous mixture of resource-poor farmers, herders, and fishers have responded to a high degree of uncertainty and vulnerability with diverse and flexible strategies. Often these strategies minimize risk while seeking optimum stable yields, commonly at the expense of maximum yields. Thus, development assistance should be designed to:

- accommodate the diverse and flexible approaches typical of resource-poor agriculturalists: this would include enhancing their ability to manage risk, retaining their flexible household organizations, encouraging diversification of income-generating activities, and supporting indigenous experimentation and innovation in the agricultural system;
- design, implement, monitor, and evaluate policies, economic strategies, and technologies for their differing effects on people of different ages, genders, ethnic groups, and economic status; and
- have available a variety of interventions (policies, programs, projects, and institutions) so that the ones most appropriate to the varied and changing needs of resource-poor agriculturalists can be selected. Long-term monitoring and feedback should be used to adjust development activities so they remain useful and relevant as people's needs and conditions change.

Concept 3: Local resources—such as local people's skills, knowledge, practices, and institutions, plus indigenous plants and animals—reflect adaptations to the diverse local conditions found in Sub-Saharan Africa. Thus, development assistance should be designed to:

- make local participation an integral part of the initiation, design, implementation, monitoring, and evaluation of development assistance projects;
- ensure that African women, who in the past have not received the share of development assistance that their role in agriculture warrants, become full participants in the development process;
- make increased use of local organizations, including assistance to improve existing organizations; and
- build on local resources, such as indigenous plants and animals and people's knowledge of how to use them. These resources have been largely untapped by development assistance agencies and they often can be improved.

Concept 4: Low-resource agriculture in Africa is based on farming systems that have interacting ecological, social, and economic components, and these farming systems are linked, in turn, to other, larger systems beyond the farm. Thus, development assistance should be designed to:

- account for the integrated nature of low-resource agriculture and how these interrelationships affect the success or failure of interventions; and
- improve the links between farms and external systems such as markets, extension systems, and transportation networks.

The guidelines above reflect the need for development assistance to be long-term, dynamic, flexible, and to incorporate a mixture of approaches. They build on the strengths inherent in African agriculture, and are meant to direct development assistance so it supports the ongoing evolution of how low-resource agriculture is practiced. This resource-enhancing approach alone will not be sufficient for agricultural development in Africa, but it could be carried out in conjunction with other development assistance approaches such as increasing non-farm employment and improving rural people's health and education.

The resource-enhancing approach described here shares some common elements with other agricultural development strategies promoted by donors, but some significant differences also

exist. For instance, many development strategies seek to improve agriculture as the primary mechanism to further overall national economic development. And within this agricultural sector, a number of approaches focus on small-scale farmers and not commercial or state-run farms. The approaches differ, however, on how best to implement this agricultural assistance.

A resource-enhancing approach seeks growth with equity—one hallmark of the New Directions/basic human needs approach to U.S. development assistance in the 1970s. Also, it draws upon approaches that were developed to respond to significant faults in the New Directions approach. The need for appropriate policy changes to spur national economic growth is drawn from the Policy Reform approach of the 1980s: the need to establish appropriate trade policy and exchange rates, to increase the efficiency of the public sector, and to develop supportive agricultural policies. Also, agriculture has specific technical and institutional needs that can be met by strengthening Africans' capabilities, as elaborated by the International Food Policy Research Institute (IFPRI).

Also, OTA finds that enhancing low-resource agriculture requires that significant attention be paid to the specific needs of resource-poor farmer, herders, and fishers. That is, policy reform must:

- assess the effects of policy changes on the poor and include measures to protect them from adverse effects;
- build African capacity to implement needed policy changes; and
- explore links between micro-level activities and macro-level reform.

Current implementation of the Policy Reform approach does not emphasize these factors.

More technically oriented approaches, such as IFPRI's, that aim to aid resource-poor farmers and herders also need to focus on specific needs:

- choosing technology for its suitability to low-resource conditions;
- giving high priority to areas where natural resource degradation is serious;
- linking research to identified needs; and
- providing farmers and herders with a broader role in agricultural development.

A resource-enhancing approach would emphasize these areas more than current technical approaches do.

These approaches are ones primarily developed by donors, with varying degrees of input from individual Africans and African governments. While donors have the responsibility to tailor work to their own goals, the lack of African involvement in determining development strategies has been a weakness of most foreign assistance. OTA surveyed some 40 African researchers and policymakers for their specific evaluation of OTA's approach for enhancing low-resource agriculture and to gather their suggestions about ways to improve the effectiveness of U.S. development assistance. These experts stessed the diversity of African agriculture—how problems and thus solutions can vary significantly from country to country. As a result, no single approach should be used to the exclusion of others. Most found OTA's analysis generally consistent with their perceptions of agricultural needs, but they did not want it to be the sole strategy of U.S. development assistance. Nor should it be perceived to maintain subsistence agriculture instead of contributing to its transformation.

Africans also emphasized the importance of increasing African capacity to deal with problems, whether by supporting education and training, institutional development (especially research), or local organizations. The starting point, many believe, is working with the technology and resources available to the majority of the people. They also expressed their hope that assistance would have a long-term focus, be free of undue political motivations, and have development as its goal. Is this possible? Some doubt that U.S. development assistance, because much of it focuses on top-down approaches and on providing food aid, can support a resource-enhancing approach without major changes in U.S. philosophy and implementation.

THE ROLE OF TECHNOLOGY

African agriculture faces a major challenge in the next few decades—it will need to double production to keep pace with a growing population and provide an adequate source of household income to purchase additional food. Although traditional, extensive, shifting agriculture will remain important in a few regions, the vast majority of the continent's agriculturalists will have to move toward a more intensified, permanent agriculture where more inputs (including information and management) are used. Technology has always played an important role in this process throughout the world. Therefore, technological innovation to enhance low-resource agricultural systems will be a major factor in determining Africa's ability to meet the challenges ahead.

A Promising Technological Framework

The technological framework with the most promise for promoting food security in Africa calls for an evolution of existing agricultural systems. More rapid improvements are possible in high-potential areas, but these areas are in a minority and changes there will not address the needs of the majority of farmers and herders who have few resources. Thus, few areas can expect rapid and widespread technological change like that which occurred in Asia. African soils are generally poorer, water and labor are often less available, human and institutional resources are less well-developed, and a number of major crops have been little researched.

To be successful given the great diversity present in African farming systems, an equally diverse array of technologies adapted to local social, economic, and environmental conditions is needed. Although Africa will benefit from global agricultural research, African problems will require a greater emphasis on Africa-specific solutions. Three efforts could contribute to this process: increasing African research capacity through human and institutional development; improving links among researchers, extension agents, farmers and herders; and giving greater emphasis to on-farm adaptive research with a farming systems perspective.

Technologies developed to support low-resource agriculture should reflect the high premium this approach places on risk aversion and the need to maintain flexibility in the face of uncertainty and limited access to resources. Farmers throughout the world are justifiably conservative when failure of technology could mean bankruptcy or even starvation. Therefore, many practices of low-resource agriculture ensure at least some production in bad periods, even at the expense of higher yields under more favorable conditions. To date, most agricultural research has emphasized maximum production

Photo credit: Consortium for International Crop Protection

Technology plays an important role in intensifying agricultural production. Crop breeding for millet and other African crops is likely to be one of the best investments in enhancing low-resource agriculture.

even though other concerns face poor farmers, herders, and fishers. For example, intercropping, a practice in which crops are grown together in an intermixed fashion helps to reduce risk of one crop's failure. Yet, only 20 percent of International Agricultural Research Center funding involves intercropping, although some 80 percent of African food is grown as intercrops.

Technological flexibility is also needed because agricultural conditions will continue to change, and at different rates, throughout Africa. Development of technology needs to build in the flexibility to react to anticipated and unanticipated events. Rapidly growing populations, migration of young men to urban areas, and the growing number of female-headed households all have implications for the development and dissemination of technology.

Currently, resource-poor farmers, herders, and fishers rely primarily on resources internal to the farm or their immediate environment. These include sunlight, rain, nutrients from plant and animal wastes, and local labor. Eventually additional external resources (purchased fertilizers, machinery, etc.) will be available but this shift to increased use of external resources is likely to be slow and gradual in many areas. Consequently, technologies that rely on local resources, labor, and institutions should be emphasized over the near term. Much development assistance has bypassed the majority of African farmers and herders because it emphasized external resource use instead. Thorough economic analysis is needed to determine the feasibility of all technological interventions, but especially to make sound choices between using external and internal inputs.

Farmers and herders' knowledge is among the internal resources available for developing useful, acceptable, and affordable technology. Their participation in identifying problems and solutions would enhance the effectiveness of technical assistance. Existing agricultural practices could be the starting point of a process combining the best of traditional and modern technologies. This requires, for example, that farmers and herders be part of research teams, that their nonformal experiments be incorporated into research plans, and that units of measure be meaningful to them.

Promising Technologies

Much uncertainty surrounds the issue of whether the technology exists to fit within such a framework and whether it can transform low-resource agriculture. It is clear, though, that some technologies and practices do exist that show high potential for wider application in the farming and herding systems of Africa (table 1-2). These promising technologies have often been overlooked and underused by development assistance agencies even though some have been developed with the agencies' support.

Table 1-2.—Promising Technologies and Practices by Agroecological Zone[a]

Technology and practices	Zone[b]	Primary benefits
Improved use of soil and water resources		
Soil and water management		
Recession farming	A,S,H	Labor-efficient method of growing crops using water from annual floods; expands area under cultivation
Water harvesting microcatchments	A,S	Increase water available from rainfall
Planting and building bunds on the contour	A,S,H,T	Increase water available from rainfall; reduce soil erosion
Tied ridges	A,S	Increase water available from rainfall
Drainage practices	H,T	Enable production on land that would otherwise be waterlogged
Terracing	T	Reduces water and soil runoff; enables cultivation on steep slopes
Minimum tillage, mulching and other soil-conserving vegetation practices	S,H,T	Prepare land without incurring costs of plowing (soil erosion, excessive leaching and compaction); organic residues and mulch help maintain fertility, reduce water and soil runoff

Table 1-2.—Promising Technologies and Practices by Agroecological Zone[a]—Continued

Technology and practices	Zone[b]	Primary benefits
Improving soil fertility		
Biological nitrogen fixation	A,S,H,T	Increases nitrogen availability
Vesicular-arbuscular mycorrhizae	A,S,H,T	Increase phosphorus availability
Manuring	S,H,T	Increases soil organic matter and soil fertility
Phosphate rock	A,S,H,T	Increases phosphorus availability
Commercial fertilizers	A,S,H,T	Increase soil fertility
Small-scale irrigation		
Gravity diversion: channeled systems	A,T	Increase water availability
Gravity diversion: poldered systems	A,S,H	Increase water availability
Mechanically fed: water lifting	A,S	Increases water availability
Mechanically fed: water pumping	A,S,H,T	Increases water availability
Improved cropping practices		
Intercropping	A,S,H,T	Reduces risk of crop failure; increases seasonal availability of food; reduces pest and disease problems; improves efficiency of resource use
Home gardens	A,S,H,T	Increase seasonal availability of food; improves nutrition in the diet
Agroforestry		
Dispersed field tree intercropping	A,S	Increases soil organic matter; provides source of fodder, fuelwood, poles
Alley cropping	S,H,T	Increases soil organic matter; provides source of fodder, fuelwood, poles
Windbreaks	A,S,H,T	Decrease wind damage, especially to seedlings; decrease evapotranspiration; provide source of fodder, fuelwood, poles
Live fencing and other linear planting	A,S,H,T	Provides source of fodder, fuelwood, poles, fencing
Genetic improvements		
Crop breeding	A,S,H,T	Provides resistance to diseases and pests; tolerance to environmental stress; improves yield
Animal breeding	A,S,H,T	Provides resistance to diseases and pests; tolerance to environmental stress; improves yield
Improved use of animals		
Mixed crop/livestock systems using small ruminants	A,S,H,T	Increase income; improve diet; reduce risk through diversification
Animal traction	A,S,H,T	Reduces drudgery; improves labor productivity; extends area of cultivation
Aquaculture	A,S,H,T	Provides source of protein; recycled nutrients; source of income
Improved systems to reduce pest-loss		
Integrated pest management		
Quarantines	A,S,H,T	Reduce risk of accidental introduction of pests
Host resistance	A,S,H,T	Improves resistance to pests and disease
Cultural controls	A,S,H,T	Reduce pest populations by manipulating farming practices, especially by intercropping and rotating crops
Biological controls	A,S,H,T	Reduce pest populations by using natural enemies
Pesticides	A,S,H,T	Reduce pest populations by using natural or synthetic biocides to kill pests, limit their fertility, or disrupt pest development
Post-harvest technologies	A,S,H,T	Improve processing and storage of foods; improve nutrition; reduce labor
Improving animal health		
Veterinary support	A,S,H,T	Reduces animal mortality and morbidity
Animal nutrition	A,S,H,T	Increases productivity; improves feed use efficiency; reduces susceptibility to disease

[a]See box 3-4 for a map of Africa's agroecological zones.
[b]Key to agroecological zones: A = Arid/Semi-Arid, S = Subhumid Tropical Uplands, H = Humid Lowlands, T = Tropical and Subtropical Highlands.

SOURCE: Office of Technology Assessment, 1988.

An important consideration in choosing the technologies reviewed in this report was their likelihood of being adopted by resource-poor agriculturalists, including influences such as expense, accessibility, and cultural acceptability. Some technologies already are in use, but show potential to be improved (e.g., made more productive, easier to use, or less expensive). Others are relatively new, but agriculturalists are likely to accept them because the technologies are well-matched to their needs and resources. Accordingly, promising technologies are judged by their ability to be:

- *Technically and environmentally sound.* This means they are able at least to stabilize, if not increase, production while conserving natural resources.
- *Socially desirable.* This means promising technologies address farmer-identified problems and operate within the constraints faced by farmers, and that they attempt to minimize the disruption of existing farming systems. It also means technologies are designed so farmers can take additional steps toward modernization as such changes become feasible.
- *Economically affordable.* This means that resource-poor farmers, herders, and fishers are able to obtain and maintain the technologies. Within the context of low-resource agriculture, this will generally emphasize the use of internal resources over externally purchased inputs.
- *Sustainable.* This means that it is feasible environmentally, socially, economically, and institutionally to maintain the technologies over the long term.

Also, the technologies discussed in the full report show potential in at least one of seven areas:

1. improving the use of local natural resources,
2. improving soil fertility,
3. improving water availability,
4. fostering genetic improvement in plants and animals,
5. improving integration of animal and cropping systems,
6. reducing food losses, and
7. enabling farmers to modernize as it becomes feasible for them.

Quantitative estimates of whether and how much these methods will increase agricultural production are difficult to make. Many past estimates have been misleading. The literature about experiments with crops and techniques is replete with examples that have not met expectations: a newly developed sweet potato that can yield at least six times the African average, and windbreaks that not only increase yields but supply valuable fodder and fuelwood. Yet adoption rates for improved varieties are low, freely supplied tree seedlings often go unplanted, and technologies developed under experimental settings are consistently less productive on-farm. Why? The answers range from farmers being unfamiliar with the practice to researchers being unfamiliar with the farmers, including the criteria used in accepting or rejecting new technology.

Nevertheless, it seems that sizable on-farm gains are possible using the types of technologies discussed here. For example, the U.N. Food and Agriculture Organization's (FAO) tests show that improved management practices alone can raise crop yields 20 to 80 percent. Full use of conservation measures could increase long-term productivity by 33 percent.

Just as important are estimates of how much current production may be lost if resource degradation continues. Africa could lose 16.5 percent of its rainfed cropland if degradation goes unchecked. Estimates of overall productivity losses reach 25 percent.

Also, however, qualitative benefits of many technologies can be as important as their potential to increase yields or prevent yield decreases. Stability of production from year to year is vital. And many practices can be used in combination, adopted piece by piece as farmers and herders can afford them.

This suggests a general sequence for supporting technological development. Efforts should first be directed toward improving and making available technologies that maximize the

use of available, low-cost, renewable resources since these are usually more accessible than purchased inputs. For instance, efforts to improve water use could first be directed at making more efficient use of freely supplied rainwater through improved management, then moving toward systems such as contour planting, water harvesting microcatchments, and tied ridges that require some structures or greater external inputs. These practices may produce only slight yield increases in average years, but their real advantages show during drought years, when technologically improved fields are able to maintain yields when other fields fail. A last step in this continuum would be the adoption of small-scale irrigation technology, which faces substantial obstacles because of its high costs and complexity.

Although OTA's analysis sees an important role for technology in the future of African agriculture, it is only one factor among many that must be considered. Technologies do not operate in isolation. Research to develop and adapt low-resource technologies must be accompanied by attempts to address many influential, nontechnical factors that operate at the national and farm level. Agricultural prices, land tenure, conservation policy, household dynamics, and women's roles, for example, all affect use of technology.

THE ROLE OF FOREIGN ASSISTANCE

The United States has the potential to play a major role in enhancing low-resource agriculture in Africa, but whether this role will be pursued to its full extent has yet to be determined. The decisions made by Congress and executive branch agencies will be important in determining the U.S. role.

Congress faces a number of critical decisions concerning development assistance to Africa, with conflicting pressures to take several different routes. Some urge continuing support for existing foreign aid legislation. Others, especially within the current Administration, advocate a new macroeconomic approach that focuses on policy reform and might suggest amending current legislation. A third possibility—one influenced by domestic budget concerns and the perception of the ineffectiveness of previous development assistance—would decrease overall foreign aid.

Congress and a Resource-Enhancing Approach

Many goals of existing legislation already support a resource-enhancing approach: they call for participation of the poor in their own development, they note the need for women to be included in development efforts, they stipulate that U.S. aid prevents environmental degradation, etc. Congress has not provided clear direction on priorities among different and sometimes conflicting goals, however. And food security, a critical need in Africa, has not been an explicit, high-priority goal. Making these clarifications would provide a stronger basis for enhancing low-resource agriculture in authorizing legislation.

Long-term commitments are necessary for many key elements of a resource-enhancing approach, such as research, training, and institution-building. Stable, long-term levels of funding, with certain reduced restrictions on its use, are among the most supportive actions that Congress can take in its appropriations activities. Current funding mechanisms, such as authorizing and appropriating several different sources of funds administered by a number of different bureaus within the U.S. Agency for International Development (AID), and ongoing attempts to reduce the Federal budget may restrict Congress' ability to provide long-term, stable funding, however.

The Development Assistance (DA) fund, administered bilaterally by AID, may be the most suitable funding source for supporting low-resource agriculture. Development is its major goal and its appropriations are less volatile than others (e.g., food aid and economic sup-

port). But in the past, DA for Africa has not received attention equivalent to that of Economic Support Funds (ESF; also administered by AID) and food aid.

Congress reversed the erosion of assistance to Africa in fiscal year 1988 with the creation of a special African development fund with a 1-year appropriation of $500 million. Its impact cannot yet be determined but its success will depend on whether Congress maintains its commitment to a separate fund for Africa in the future, on how AID uses the fund's provisions for increased flexibility, on whether AID and Congress ensure that funds are not diverted to other programs, and on whether the fund is used to support low-resource agriculture.

AID, the World Bank, and other assistance agencies are often criticized for their inability to support resource-poor agriculturalists. Yet Congress already has mandated many elements of a resource-enhancing approach and has appropriated funding that could be used for this purpose. Therefore, perhaps the most crucial congressional responsibility is oversight to ensure that funds and policies intended to enhance low-resource agriculture are used effectively.

Detailed oversight will be necessary to ensure that donor activities are indeed supportive of resource-poor farmers and herders but constraints on staff time and committee jurisdiction may make this difficult. Increased cooperation among the seven committees with direct jurisdiction over U.S. agricultural assistance, an improved database on AID expenditures in Africa, and AID/Congress development assistance working groups could save staff time and improve the quality of congressional oversight.

With more effective oversight, some potentially burdensome congressional restrictions on AID might be reduced. These include requirements for notification regarding reprogramming funds, procurement requirements, restrictions on aid to specific countries and commodities, and earmarked funds. The legislation creating the new African development fund relaxed some of these congressional requirements. It provides an important test of the benefits of such an approach, including how well AID can implement congressional intent without detailed earmarking for guidance.

Three Categories of Assistance

To implement a resource-enhancing approach to African agriculture, development assistance must support three types of activities, involving a range of donor and African organizations with different strengths and weaknesses:

- local-level work, where activities would include support for local institutions, households, and individual agriculturalists;
- support for formal agricultural institutions necessary for agricultural development, where activities would include research, education, extension, and marketing; and
- national-level work, where activities would include assistance for supportive national policies and national capabilities to create and implement them.

Local organizations, often comprised in part of the resource-poor agriculturalists for whom assistance is intended, will play key roles in development assistance. These groups range from informal, self-help groups to more formal ones. Their participation is likely to increase the relevance of development activities to local conditions, increase its cost-effectiveness, and increase its sustainability over the long term.

Major donors have been largely ineffective working at the local level. Many donors have failed to tap the potential of local organizations and sometimes have made overwhelming demands on local groups and thus, undermined the groups' effectiveness. Yet the needs of local groups are large enough that they may require the resources available only from major donors. In that case, the Peace Corps, U.S. private voluntary organizations, and similar groups have the potential to act as intermediaries between the larger donors and local groups in addition to implementing their own sizable local-level programs.

Other high priority activities will be developing and improving agricultural research and

training institutions. The major bilateral and multilateral donors are best able to provide the comparatively high levels of long-term funding needed for this type of development. AID, in particular, has a comparative advantage in tackling these activities. Special efforts will be needed, however, to ensure that training and research are responsive to the particular needs of resource-poor agriculturalists. For example, training will need to build understanding of how low-resource agriculture works, ensure that women receive adequate training, provide as much training as possible in Africa, ensure that curricula are relevent to African conditions, and combine U.S.-based work with support for research for Africans in Africa.

Support for building institutions has had limited success in Africa, whether funded by U.S. AID or the World Bank. Recent improvements, however, suggest that both may be more effective in the future. AID's 1985 "Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa" is one element of AID's institution-building approach. Many of its features are supportive of a resource-enhancing approach, for example, the need to build African technical capabilities and for long-term technology development. Questions remain, however, regarding the apparently minor role of farming systems research in this approach and whether its narrow geographic and commodity approach is suitable.

National policies that support agriculture and resource-poor agriculturalists are necessary if low-resource agriculture is to be enhanced. Major donors such as AID and the World Bank

Photo credit: Donald Plucknett/Consultative Group on International Agricultural Research

Support for agricultural research is an appropriate priority for U.S. development assistance. U.S. contributions helped the International Institute of Tropical Agriculture and the Rwandan national research program provide these farmers with improved cassava varieties.

have significantly increased funding in recent years to support reforms of national policies. These changes have had ambiguous results concerning their impact on increased food security for resource-poor farmers and herders. Therefore, support for sweeping reforms may be unwarranted until donors improve their understanding of these impacts and examine the actual policy needs of resource-poor farmers and herders. The World Bank has the analytical capabilities to lead such an effort.

AID and a Resource-Enhancing Approach

AID is the principle U.S. agency that would bear responsibility for implementing a resource-enhancing approach to development assistance in Africa. The Agency's current overall strategy for African development could be compatible with such an approach, but full implementation would require substantial changes in priorities, operations, and general philosophical approach. For instance, AID would have to ensure that strategy papers, such as ones supporting women in agriculture and addressing environmental sustainability, are implemented more effectively and that Africans assume a larger responsibility for carrying out U.S. aid. In addition, AID's current emphasis on increased funding for policy reform might need to be lessened considering the impact such reforms have had on resource-poor agriculturalists.

Over the past few years AID has made changes that could help the agency enhance low-resource agriculture, including more decentralized decisionmaking, increased attention to research, longer term support for projects, and an increased emphasis on projects' sustainability. At the same time, the impact of these shifts may be offset by deep personnel cuts, a lack of appropriate technical personnel, inadequate language and cultural skills, a flawed reward system, and a project design system that is cumbersome, inflexible, and oriented to achieving short-term results. These latter constraints were identified long ago and have remained unresolved. Therefore, their remedy would require concerted effort on the part of the Administrator and all AID staff.

The Road Ahead

The decision to assist resource-poor African farmers and herders is not made in isolation within AID or within Congress. Broader U.S. policy concerns direct congressional decisionmaking and these reflect a variety of American concerns.

For example, U.S. farm trade suffered an overall decline in the 1980s with some commodities losing market shares to foreign competition. Recent legislation, passed with the backing of some U.S. farm groups, curtails U.S. support for certain crops in developing countries due to concerns that such support helped those countries improve their competitiveness. Newer analyses, however, suggest that stimulating African development will have greater long-term benefits for U.S. agriculture than attempts to limit U.S. technical assistance to African farmers. They need higher incomes to buy American products and higher incomes will require greater agricultural production. Yet pressing concerns regarding the health of the U.S. farm sector and trade balance are likely to override longer term considerations.

Also much of the American public has little awareness of the costs and benefits of U.S. development assistance and perceives that the United States spends too much money on foreign aid; some believe that as much as 40 percent of the U.S. budget goes to development aid. In fact, the correct figure is no more than 1 percent and has declined steadily since the 1940s. Almost inevitably, comparisons are made to the successes of the Marshall Plan to rebuild war-torn Europe when problems were simpler to solve and more resources were available.

Whether the United States invests too much or too little in meeting its interests in Africa is a subject that will continue to be debated. Expectations that dramatic results are possible are misguided, though, even if increased funding was available. The road to African food

security is a long and difficult one. Decisions on how to address the challenges ahead are African ones. Clearly, however, U.S. foreign assistance legislation states that the United States will be a partner in this process. And an approach that enhances low-resource agriculture will be an essential component of any effective U.S. development assistance effort.

FINDINGS AND OPTIONS

Congress can shape U.S. development assistance in a number of ways. This chapter addresses how Congress can use these methods to improve the effectiveness of U.S. aid and enhance African agriculture (table 1-3).

Finding 1: Low-resource agriculture—farming, herding, and fishing—is the predominant form of African agriculture, a largely untapped development resource, and a necessary starting point for meeting future food security needs.

Agricultural development is recognized as key to African economic development, that is, meeting food needs, maintaining and increasing rural employment, and stimulating the internal economic markets necessary for nonagricultural growth. Low-resource agriculture is the predominant form of agriculture throughout Sub-Saharan Africa and experts believe that it will remain the mainstay of African agriculture at least for the short to medium term. But low-resource agriculture, as it now exists, is neither capable of meeting Africa's food and employment needs nor of keeping up with growing populations and environmental degradation. Thus, any broadly based plan for African agricultural development must find ways to enhance low-resource agriculture.

Resource-poor African agriculturalists are rich in local resources, such as skills, knowledge of indigenous plants and animals, understanding of the environment, and indigenous institutions. Agricultural development strategies have consistently bypassed these resources, sometimes contributing to their loss, often to the detriment of aid's effectiveness. More successful agricultural development depends, in part, on tapping these resources by developing methods to identify and use them.

However, the United States has no overall policy for enhancing low-resource agriculture in Africa despite the importance currently given to providing agricultural assistance. For instance, AID's current strategy for Africa lacks many features necessary for such an approach. In practice, development assistance commonly either has not addressed low-resource agriculture or attempts have been made to improve it in inappropriate ways. Most donors have not developed the methods needed to improve low-resource agriculture. Developing a strategic plan for enhancing low-resource agriculture would bring proper focus to its current status and potential and contribute to development and implementation of needed methods.

Many strategic questions regarding the U.S. role in development assistance are being debated now. For example, a significant number of organizations are taking part in a 1988 effort coordinated by Michigan State University. Its goal is to help shape U.S. development policy in the 1990s. Also, the U.S. foreign assistance legislation is under continuing scrutiny regarding its overall goals and their implementation. The appropriate role of macroeconomic policy reform, a major Administration focus, is one debated topic.

Such efforts will affect any U.S. approach to enhancing low-resource agriculture, but they do not provide the detailed guidance for that work. Therefore, the U.S. development assistance community needs to give specific attention to the strategic aspects of work that focuses on resource-poor farmers, herders, and fishers. This need is most acute for AID, the primary provider of U.S. development assistance. But other organizations using U.S. funds for agricultural development, private groups, additional U.S. agencies whose work affects devel-

Table 1-3.—Findings and Congressional Options for Enhancing Low-Resource Agriculture in Africa

Findings	Options
1. Low-resource agriculture is the predominant form of African agriculture, a largely untapped development resource, and a necessary starting point for meeting food security needs.	1a. Assign AID the lead role in developing and coordinating a U.S. approach to enhancing low-resource agriculture. Support an international/interagency conference to set out such a strategy and follow up with agency 5-year action plans. 1b. Request that AID and the World Bank (through the U.S. Department of Treasury) evaluate how policy reform could best serve the needs of low-resource agriculture. Base continued support for and direction of reform on these evaluations.
2. Strengthening African research, education, and training is one of the most effective and sustainable contributions that the United States can make.	2a. Support the long-term development of African agricultural institutions. Oversee AID and World Bank activities to ensure this work assists resource-poor agriculturalists. 2b. Support increased formal education and training of Africans in ways that enhance low-resource agriculture.
3. Improving low-resource agriculture entails work at the local level. Supporting local African groups and intermediary organizations is one way of working at the local level. The Peace Corps and private voluntary organizations (PVOs) also can work locally and can act as intermediaries between large donors and local groups. These intermediaries could be strengthened by improved technical support and evaluations.	3a. Direct AID to develop technical support mechanisms for indigenous African organizations, PVOs, and the Peace Corps. These mechanisms could draw upon universities and research centers (African, U.S., international) and private organizations. 3b. Request that the Peace Corps develop and implement an ongoing evaluation system.
4. Congressional oversight will be crucial for implementing a resource-enhancing approach since legislation and funding mechanisms are already in place. Changes in oversight will be necessary to increase its quality while reducing the burden it places on AID.	4a. Ensure that all funds provided for the new bilateral development fund for Africa are used for development purposes. Oversee that other types of agricultural funding support low-resource agriculture. 4b. Improve oversight activity and smooth the AID/Congress working relationship. 4c. Reduce the restrictions on the use of development assistance. Monitor the impacts of newly made reductions.
5. Long-term commitments and stable funding levels are necessary.	5a. Maintain stable appropriations for development assistance. Emphasize Development Assistance within bilateral assistance. Continue policies of appropriating a special development fund for Africa and significant U.S. contributions to the International Development Association of the World Bank. 5b. Encourage AID to address a set of internal constraints. AID could evaluate the impact of its operational structure and procedures on its development work, then begin institutional reforms.

SOURCE: Office of Technology Assessment, 1988.

opment, and African groups at all levels need to be involved in developing this approach.

Option 1a: Congress could assign the Agency for International Development (AID) the lead role in developing and coordinating a U.S. approach to enhancing low-resource agriculture in Africa. To help develop such an approach, Congress could support an international/interagency conference to assess the status of current programs and set out a general strategy, under the auspices of AID. Participating organizations could prepare and implement 5-year action plans subsequently

Interagency approaches to facilitate a foreign assistance strategy have worked in the past. AID and the State Department, for example,

led the development of U.S. foreign assistance strategies for tropical forests and maintaining biological diversity. Both plans included strategy conferences that brought together researchers, policymakers, and practitioners; highlighted the importance of an issue that had not received adequate attention; underscored major areas of concern; and identified avenues to address those areas. Interagency task forces then defined specific U.S. efforts and individual agencies developed action plans to implement the strategies developed by the conference and task forces.

A similar strategy conference on how to enhance low-resource agriculture in Africa could bring a wide variety of organizations together to discuss U.S. priorities, compare successful methods, determine areas of collaboration, and identify important research topics. OTA's work suggests that several issues need to be addressed by such a group:

- assessing the comparative advantages of different donor organizations;
- developing relevant technologies;
- supporting the development of formal African agricultural institutions (e.g., universities, research centers, markets, policymaking bodies) and the trained personnel to staff them;
- supporting the development abilities of local African organizations; and
- supporting the development and implementation of relevant agricultural policies.

These topics are not new and have been addressed before. Using a specific resource-enhancing framework would be essential to breaking new ground. To do so, conference planning and subsequent implementation should be based on analytical criteria of:

- *sustainability*—environmental, economic, institutional, and technical;
- *diversity and flexibility*—accommodating the diversity of resource-poor farmers and the conditions they face, and the flexible ways in which they respond;
- the use of *local resources* of the resource-poor farmers, herders, and fishers which includes methods of fostering their participation in development; and
- accounting for the ecological, social, and economic components of the farming *systems and their off-farm links.*

AID should host this meeting because it is the agency ultimately responsible for carrying out most of U.S. development assistance. However, substantial efforts must be made to draw on other expertise, divergent views, and imaginative suggestions from a variety of groups and, as such, much of the conference planning should be assigned outside AID. Broad participation also could ensure that the meeting has an impact throughout the U.S. development assistance community. The Peace Corps, the African Development Foundation, the World Bank, private voluntary organizations, universities, and relevant executive agencies (the Departments of Agriculture, Commerce, and Treasury, etc.) should participate.

Significant African representation would be crucial before and during the conference to ensure that the work addresses African conditions and that an expanded role for African organizations is included. Members of Congress and their staffs could participate to contribute a congressional perspective. And a significant number of women must be included—whether they represent Africa's large number of women farmers or are drawn from the community that serves women farmers.

Task forces grouped around individual topics, like those associated with earlier strategy conferences, could be formed to continue working after the conference and to maintain communication among groups. Individual agencies could develop action plans to define their specific responsibilities and priorities, means for interagency cooperation, and funding requirements. These action plans could be incorporated into agency policy and planning documents. Congress could consider these plans as it both sets and oversees development priorities.

Option 1b: Congress could request that AID and the World Bank (through the U.S. Department of Treasury) perform in-depth analyses of how policy reform could best serve the needs of African resource-poor farmers and herders. Continued support for and future

directions of reform activities could be based on these evaluations.

Support for policy reform quickly has become a large component of development assistance. By 1987, reform-related lending made up 35 percent of AID Africa Bureau's agricultural loans and 55 percent of the World Bank's commitments to Africa. Needed reforms have been known for some time but evaluating the effects of donors' activities to stimulate such reform is comparatively recent.

Evaluations are incomplete and ambiguous concerning policy reform's effects on resource-poor farmers and herders. However, evaluations have raised concerns regarding reform's: lack of grounding in actual, local agricultural conditions; its potential to harm large segments of the poor; and its lack of emphasis on building African capability to carry out and continue policy reform once donor's efforts diminish. Also, evaluations have called for additional research addressing these concerns. For example, research is needed to identify methods that link macroeconomic reforms with conditions at the microeconomic level. Without such methods, macro-level reforms may not match micro-level needs (e.g., for removing local technical or marketing obstacles) and adverse local effects of macro-level reforms may be difficult to identify.

Congress could stabilize or decrease reform expenditures until such analyses have been completed and policy reform activities modified as needed. In addition, Congress could consider what role the United States should have in reform activity.

The World Bank, because of its sizable staff of economists and its ability to marshall support from many donor countries, might be the most effective lead agency for researching and supporting policy reform. Such a lead agency could coordinate work and discourage individual donors' from sending contradictory signals to recipient countries. But any lead agency must be sensitive to the policy needs of resource-poor agriculturalists and the representatives to the World Bank may need congressional encouragement to promote such work.

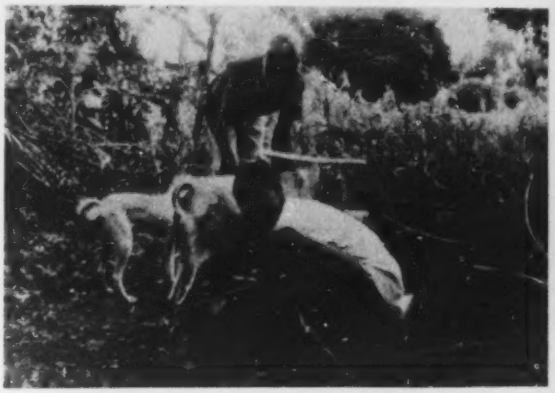


Photo credit: Winrock International

Concerns have been raised regarding the local impact that policy reform has on low-resource farmers and herders such as these in Kenya.

In the past, Congress has examined substantive issues of World Bank work via the U.S. Treasury Department, which directs the vote of the U.S. Bank Representative. For example, congressional hearings on World Bank activities during 1983-84 led the Treasury Department to perform an extended review of the environmental aspects of the World Bank's work. The Department actively promoted bank changes in this area as a result of its review. Congress could ask the Treasury Department to begin a similar extended review of the World Bank's policy reform work and accompany such a request with oversight hearings.

Congress could encourage AID to support a narrower set of policy-related activities that draw on AID's particular strengths. For example, U.S. strengths in training and institutional support could be directed to developing African abilities to analyze and implement agricultural policies that support low-resource agriculture. With these skills, African nations would be better able to develop and continue reforms over the long term.

Finding 2: Strengthening the abilities of Africans' to respond to their agricultural needs through research, education, and training is one of the most effective and sustainable contributions that the United States can make to African development.

Africans and donors alike increasingly see agricultural development as fundamental to overall African development. For agricultural development to occur, Africa will require its own strong agricultural institutions staffed by trained Africans, supported by its governments, and capable of responding to local concerns. For example, agricultural research institutions are necessary to develop, adapt, and improve technologies for resource-poor farmers, herders, and fishers; planning institutions are necessary to develop and implement supportive agricultural policies; and training institutions are necessary to prepare staff for these roles. Concurrently, governments must be ready to provide for recurrent and ongoing costs without which agricultural institutions cannot function: equitable salaries, upkeep, costs for travel, equipment, distributing reports, subscriptions to journals, etc.

In each case, the diversity of African agricultural systems requires technologies, policies, and training adapted to local social and environmental conditions. International organizations and those in the developed countries have neither the expertise nor the resources to meet so many differing local needs. Nor is development led by external groups likely to be sustained.

Donors do have a clear role to play in providing agricultural training for Africans and in supporting African institutions, however. The United States has a comparative advantage in these two areas and such work would be an appropriate U.S. priority. Past efforts in these areas often have not met the specific needs of resource-poor farmers, herders, and fishers and this problem must be addressed.

Option 2a: Congress could support the long-term development of African agricultural institutions capable of assisting resource-poor agriculturalists. As part of this support, Congress could oversee AID's 1985 research plan and the World Bank's work.

AID set out a coordinated approach in 1985 to support African research institutions and faculties working in agriculture. Known as the "Plan for Supporting Agricultural Research and Facilities of Agriculture in Africa," AID envisioned a commitment of significant resources (at least $100 million per year) over a 15-year span for supporting African research systems and faculties of agriculture, and backing cooperative research work through the international agricultural research centers and U.S. universities. The Plan is an important step in U.S. support of African capabilities both in the level of resources to be committed to this work and in its long-term approach—a departure from past, short-term efforts.

Congress could support this work in several ways. First, institution-building takes time, so congressional authorization and appropriations should provide resources for extended time periods and avoid unnecessarily introducing non-development interests that would slow work. Also, congressional oversight is essential on a number of issues:

- Is AID committed to implementing the Plan for its full term?
- Are established levels of funding being met?
- How is AID refining the Plan to meet African conditions?

Also, oversight is needed to ensure that the Plan actually addresses the needs of resource-poor agriculturalists, some of whom are now overlooked. For example, AID does not explain in detail how agricultural institutions can be linked to the needs of the farmer and herder, what their role in technology development should be, how to ensure the environmental sustainability of technology, how to address women's needs, nor how to make the best use of local resources. AID is currently reviewing the plan and a congressional oversight hearing could provide Congress with an update on its status while signaling to AID the need to address these points.

Congressional examination of the World Bank's support for agricultural institutions also is justified. The Bank's institutional support has been criticized as inadequate in quality and quantity. And a recently completed analysis of African research needs by the Bank highlights the importance of developing national research

capabilities, but the Bank's approach suffers from many of the same weaknesses as AID's. Congress can make its concerns known via oversight and also could instruct the U.S. Treasury Department to advocate increased work by the Bank on building agricultural institutions.

The international agricultural research centers (IARCs) have an important role supporting African institutions. While primarily concerned with research, the centers could expand their training and institutional support. Any such expansion will require AID's continuing support to the centers. AID can also ensure that the centers gear more work to the needs of resource-poor farmers and herders.

Option 2b: Congress could increase support for formal education and training of Africans in ways that would enhance low-resource agriculture.

African countries will need increasing numbers of trained people (e.g., researchers and policymakers) to staff agricultural institutions. They will need training to assess the needs of resource-poor agriculturalists and to identify ways to meet those needs. Specific ways for the United States to be involved in this training could be determined at the strategy conference discussed earlier. New legislation or earmarked funds do not seem necessary but congressional oversight could ensure that education and training are priorities for U.S. development assistance.

U.S. universities could play a major role in education and training and U.S. support for these institutions will be an important contribution. Undergraduate education should be the responsibility of African educational institutions primarily. However, increased opportunities for graduate training could be offered in the United States.

Only certain U.S. institutions are equipped to address the particular needs of low-resource agriculture and a better match of African students and U.S. programs is necessary. Mechanisms to ensure the complementarity of training with the needs of African agriculture include tying U.S. graduate training to thesis research in Africa and providing increased training opportunities for African women. Also, AID could identify other appropriate programs that are particularly relevant to African conditions and tap those programs. AID-provided strengthening grants to U.S. universities could further the development of such programs where a commitment to low-resource work exists.

Assistance for training and education should continue once Africans who were students assume responsibilities in Africa. Small grants to begin research, travel funds for collaboration with senior scientists, and longer term "twinning" efforts between African and other institutions (e.g., U.S. universities, private organizations, and the IARCs) could ensure that trained Africans are able to make use of and update their education.

Finding 3: Enhancing the capabilities of resource-poor farmers, herders, and fishers will require support at the local level. Supporting local African groups and African intermediary organizations who provide services to these groups is one means of working at the local level. The Peace Corps and private voluntary organizations can work directly at the local level while also acting as intermediaries between larger donors (e.g., AID and the World Bank) and local groups. Improved evaluations and strengthened technical backup would increase the effectiveness of these intermediaries.

Agricultural development will depend, in part, on developing technologies appropriate to the diverse local conditions of Africa and matching technologies with the social organizations necessary to make use of them. Development of formal agricultural institutions and agricultural policies need to be linked to the local level to ensure their relevance to actual conditions. However, local African organizations, whose membership includes resource-poor agriculturalists, offer donors an additional means of reaching the local level directly. These organizations can initiate work appropriate to local conditions, mobilize local resources, and maintain work after outside assistance ends.

The Peace Corps and many private voluntary organizations (PVOs) have experience working with local organizations and they, along with African intermediary groups, could become important sources of support for local organizations. This might entail a shift from their current focus on implementing projects. Often, however, PVOs are technically weak and do not carry out the evaluations necessary to identify their particular strengths and weaknesses. Correcting these two problems is a prerequisite for providing more effective U.S. aid at the local level.

Larger donors such as AID and the World Bank commonly do not work well at the local level nor have they given much attention to the growing numbers of local African organizations. Their support of local groups may be necessary because the Peace Corps and PVOs do not command enough resources to match the growing needs of African groups. The Peace Corps, U.S. PVOs, and African intermediary organizations could, however, become important intermediaries between large donors and local organizations. But, evaluations of individual group's abilities to carry out effective low-resource work must precede their selection for funding.

Photo credit: Watson/U.S. Peace Corps

The Peace Corps, like many PVOs, works well with local groups such as this women's gardening cooperative in Mali. Better technical support and improved evaluations would ensure that this work is as effective as possible.

Option 3a: Congress could direct AID to develop technical support mechanisms to help PVOs, the Peace Corps, and others (including indigenous African organizations) identify, adapt, and promote promising technologies. Such mechanisms could draw upon the expertise of universities and research centers (U.S. and African), the international agricultural centers, and private organizations (African and U.S.). The goal would be to have these services in place within 5 years.

Members of the development assistance community, such as the Peace Corps, PVOs, and African organizations that have staff based in African communities, know the needs and abilities of resource-poor farmers and herders in ways that few others do. Often, however, these people lack the technical skills (including managerial and financial skills) needed to support agricultural development most effectively. The costs of developing and maintaining these skills for each group would be prohibitively high. Instead, a number of African and U.S. sources of technical expertise could be linked to local groups. This linkage should be two-way; for example, farmers' research needs should be passed to research centers as these groups provide technical information to farmers.

Some U.S. assistance has been effectively provided in this manner. For example, the AID-funded Forestry Support Program provides technical support benefiting AID missions and PVO-funded projects.

The importance of such efforts is likely to increase. African groups are increasingly able to assume direct responsibilities for implementing development programs. Some larger donors

are cutting their field staff and relying more on PVOs. And Congress is reinforcing this pressure to channel significant amounts of U.S. development assistance through U.S. and African PVOs. Increasing the abilities of these groups to be technology brokers between technical experts (e.g., agricultural researchers) and groups of farmers and herders will improve their effectiveness. Support for groups that have demonstrably good results at the local level and for groups that focus on low-resource agriculture is important.

Option 3b: Congress could request that the Peace Corps develop and implement an ongoing system for evaluating its work.

The Peace Corps is considered effective in local-level work, providing skilled training for its volunteers. But the quality of its work varies across geographic regions and disciplines; its institutional memory is short; and long-term planning and implementation are difficult to carry out. The evidence for these strengths and weaknesses is largely anecdotal, however.

As conditions in Africa change, it will be important for the Peace Corps, which seems particularly effective, to keep pace. An ongoing evaluation program could help the Peace Corps identify areas of proven effectiveness, and then enable the agency to concentrate its resources there. Also, many weaknesses listed above are inherent in short-term, volunteer-based work. Project and program evaluations could seek ways to compensate for these problems. Evaluations might also address how well the Peace Corps might function as a technology broker, linking resource-poor agriculturalists with agricultural researchers.

Finding 4: Congressional oversight will be crucial for using development assistance to enhance low-resource agriculture. Appropriate legislation is already in place and many complementary changes in funding have been made. Changes in the way oversight is conducted may be necessary to increase its quality while reducing the burden it places on executive agencies, though.

The current legislation governing U.S. development assistance provides a mandate for enhancing low-resource agriculture. In addition, the 1987 creation of a separate, bilateral African development fund and corresponding reductions of restrictions on its use have stabilized funding and increased flexibility. Thus, Congress already has provided the basis for AID to improve how it addresses low-resource agriculture.

Criticism is likely to remain regarding AID and other donors' abilities to meet the needs of low-resource agriculture, however. Many argue that the needs of resource-poor farmers and herders have not been the focus of U.S.-funded research, training, and institution-building programs. Oversight will be needed to ensure that U.S.-funded donors respond to this criticism and, where necessary, sharpen this focus.

Current forms of oversight have not proven adequate to this task and evidence exists that oversight sometimes has impeded the work of donors due to its excessive demands. Thus, Congress could revise oversight procedures to increase the quality of information provided while reducing the burden on agencies providing it. In 1987, Congress made several such changes by reducing a number of restrictions on AID's operations regarding procurement, earmarks, and program funding. These reductions will need to be monitored for their impact on AID's efficiency and to evaluate how well AID carries out congressional intent with this more flexible guidance from Congress.

Option 4a: Congress could oversee that all the funds provided in the new African development fund are used for development objectives and that agricultural funding supports the improvement of low-resource agriculture. Oversight for the latter also could be applied to other U.S.-supported organizations such as the World Bank.

Congress created a separate development fund for Africa for fiscal year 1988 totaling $500 million. The fund provides more stable levels of African development assistance (and may continue to do so if maintained in the future), helps protect this funding from use for short-term political objectives, and provides AID with increased programming flexibility since it contains few restrictions for the use of funds.

If the fund's potential benefits are to be realized, however, Congress will need to ensure that the monies appropriated are not diverted from development aid. In addition, the fund sets no levels for spending on agriculture. AID has made agriculture a focus of its assistance for Africa but Congress could monitor whether the percentage of funds used is adequate.

The existence of this or any other fund is not adequate to ensure that U.S. assistance enhances low-resource agriculture. Donor agencies receiving the majority of U.S. development assistance funds undoubtedly have the capacity to support such development. Yet evaluations show that AID and the World Bank have weak records concerning the development of technology appropriate for resource-poor farmers and herders; that their track record is poor for supporting the development of African institutions able to address low-resource agriculture; that their training programs are missing important opportunities; and that links between their policy reform work and the local level are weak. In particular, questions exist whether the development assistance community is taking advantage of the opportunities offered by African organizations, including local ones. Therefore, congressional oversight of substantive issues such as these will be necessary to ensure that funds are provided for agricultural development and also used to address the needs and abilities of resource-poor agriculturalists.

Option 4b: Congress could make improvements to its oversight activities and smooth the AID/Congress working relationship.

A need exists for in-depth, long-term oversight on substantive matters. This need conflicts with the time available to Congress and with the more general expertise of Members of Congress and their staffs. Small staffs oversee large executive branch programs annually, often in conjunction with other duties. If inadequately prepared, oversight can provide little useful information to Congress and absorb development resources that could be spent on implementing programs.

This problem is aggravated by the many congressional actors involved in oversight. For example, seven committees and additional subcommittees have direct jurisdiction over development assistance and Members often take part on an individual basis as well. As a result, AID (the agency most affected) often responds to a multitude of congressional requests which may be duplicative or contradictory. These problems are exacerbated by the somewhat adversarial relationship between Congress and AID.

A number of methods are available to improve the substance of oversight, cut its undue costs, and reduce problems in communication. For example, an informal task force of authorizing and appropriations committee and subcommittee staff could help coordinate oversight and reduce redundancy. Such a task force might also be a forum for a detailed examination of development issues and new approaches. It could tap outside expertise in this process, especially that of Africans visiting the United States.

Another means to provide specialized expertise to staff would be to form a group of experts in development work to help oversee U.S. multilateral and bilateral development assistance policy. Such a group could be constituted informally or more formally established as a Development Assistance Study Institute. Such an institute could provide a forum for congressional members and staff to meet with executive agency personnel and other groups to focus oversight and gain substantive input into the process. An institute such as this could be a new body or an addition to an existing one, such as the Energy and Environment Study Institute.

An AID/Congress forum could be established under these or other auspices. An AID task force could identify congressional constraints on its work and a corresponding congressional group could identify high-priority oversight issues for AID to address. This forum could begin an ongoing process for resolving some of the underlying strains between AID and Congress.

Oversight also could be improved by increasing the availability and relevance of specific information on U.S. assistance. For example, Congress could request AID to improve its data-

base on its agricultural work in Africa. Currently, AID is unable to provide such information. At the same time, Congress needs to make its data needs clearer so as to reduce the amount of data generated by AID in anticipation of congressional needs that do not materialize.

Option 4c: Congress could reduce restrictions on the use of development assistance funds in order to increase its efficient use, while monitoring the impact of newly granted flexibility.

Congress has placed a variety of restrictions on how AID implements development assistance. In some cases, these restrictions have direct costs to AID, for example, it devotes money and staff time to notifying Congress regarding reprogramming of funds and to providing mandated reports. AID has testified that at least 200 annual staff-years are devoted to preparing materials for Congress and dealing with various congressional groups. In other cases, AID's costs due to congressional limits are less direct, for example, procurement requirements may increase the cost of overseas purchases, appropriations earmarks may require more detailed accounting, and restrictions on aid to individual countries and commodities may decrease the overall effectiveness of AID's program. Also, AID responds to more informal congressional pressure to achieve multiple (sometimes incompatible) goals and to use assistance for non-development purposes. Congress and AID could streamline this process so that more of these resources could be spent on development.

Congress made several legislative changes in 1987 to reduce restrictions on AID's assistance to Africa: reprogramming and procurement restrictions were reduced and the number of earmarks was significantly cut. If these changes prove effective, Congress could increase AID's flexibility further by providing no-year money, reducing additional earmarks, etc. Also, complementary changes could be made to define priorities among the multiple mandates in the Foreign Assistance Act to reduce non-developmental pressures on the use of assistance.

At the same time, Congress needs to monitor carefully how AID makes use of its increased flexibility. Granting increased flexibility to AID may enable more efficient and effective use of its resources. However, it also increases the risk that congressional priorities for development assistance may not be followed fully. AID's past inability to address the needs of resource-poor farmers and herders contributes to concern over this issue. Again, this emphasizes the need for substantive and thorough oversight. Congress could ensure that continued flexibility depends, in part, on AID's responsiveness to broad congressional direction for development assistance.

Photo credit: F. Mattioli/U.N. Food and Agriculture Organization

Improved management of land and water resources is an important part of enhancing low-resource agriculture. This is recognized in the new African Development Fund, an attempt by Congress to provide flexible guidance and fewer restrictions for AID while still specifying general priorities.

Finding 5: Long-term commitments and stable funding levels are necessary for donor agencies to provide effective development assistance, especially for enhancing low-resource agriculture.

Many development assistance goals identified by OTA as necessary for African agricultural development cannot be reached quickly nor if development assistance funding undergoes large and unpredictable swings. Research, agricultural institution-building, and supporting the development of local organizations are all long term in nature. Development assistance for these purposes must be correspondingly long term. And stable levels of aid are important for planning long-term work. Unantici-

pated fluctuations in aid, whether caused by changes in overall assistance funding or by changes in political goals, reduce the effectiveness of aid. Such swings have stopped successful efforts and ended other work before results could be achieved.

Option 5a: Congress could appropriate stable levels of bilateral and multilateral assistance for Africa. For bilateral assistance an emphasis on Development Assistance would best support such long-term stability, a continuation of the 1987 policy creating the development fund for Africa and increasing U.S. contributions to the International Development Association of the World Bank.

U.S. bilateral agricultural assistance to Africa is provided primarily through three AID-administered funding sources: Development Assistance, Economic Support Funds (ESF), and food aid. Of the three, Development Assistance is the most suited for providing stable levels of funding in support of a long-term approach. U.S. legislation regarding development generally supports enhancing low-resource agriculture. Also, Congress provided the means to maintain stable funding levels for AID's African Development Assistance account by creating the new development fund for Africa. Previously, African funds were held with worldwide development funds and were vulnerable when discretionary funding was reduced due to earmarks for aid to other regions.

The other funding sources continue to be held in common. They are less appropriate for providing long-term stable support for this and other reasons. ESF usually are provided to recipients for political and security reasons and tend to be volatile. Africa's needs are seen as less pressing than those of other regions. Food aid can fluctuate substantially due to changing emergency needs in Africa and U.S. food surpluses.

While Development Assistance may be the most appropriate form of aid for African social and economic development, the United States sometimes has not made it the primary source of African assistance. Between 1980 and 1985, ESF to Africa tripled thereby exceeding Development Assistance funding, which had increased by one-fourth. This decline in the relative importance of Development Assistance took place as worldwide U.S. foreign assistance doubled, primarily through increases in ESF and military aid.

With declines in total foreign assistance in 1986 and 1987, ESF to Africa was severely cut and Development Assistance became the predominant source of funding to Africa. Yet the cuts in Development Assistance and ESF put 1987 funding to Africa close to 1980 levels. The $500 million appropriated for the development fund for Africa in fiscal year 1988 (and also an additional $50 million for projects of the Southern Africa Development Coordination Commission) halted the decline in Development Assistance for Africa. If maintained, the fund could provide the means for stabilizing Development Assistance to Africa for the long term.

U.S. support of multilateral development organizations has also fluctuated, with some exceptions. The International Development Association (IDA) of the World Bank provides concessional loans to the poorest countries. United States IDA funding fluctuated from a high of $1 billion to a low of $520 million between 1980 and 1987. The U.S. agreement to provide $2.875 billion over the next 3 years, along with congressional appropriations of $915 million for fiscal year 1988, will help stabilize IDA funding to Africa, assuming that appropriations continue at agreed-upon levels.

U.S. support for the African Development Fund, the concessional loan window of the African Development Bank, has had fairly stable funding since 1986. Funding for the United Nations development agencies that receive voluntary U.S. contributions (e.g., the United Nations Development Program and the International Fund for Agricultural Development) increased between 1980 and 1985 but declined significantly in 1986 and 1987. The U.N. Children's Fund was an exception; its funding has remained relatively constant since 1984.

Maintaining stable funding over the long term is made difficult by the annual congressional authorization and appropriations process. Longer term authorizations and appropriations (possibly 2 to 4 years) would help set stable fund-

ing levels, allow agencies to do long-term planning, help protect development funding from shifts in funding or diversions to other uses, and free Congress to spend additional time conducting oversight.

Option 5b: Congress could encourage AID to address a set of internal constraints that hinder effective implementation of development assistance. First, AID could evaluate the effect its operational structure and procedures have on its development work. Then, Congress and other organizations could help AID develop and implement internal reforms.

AID has made a number of positive operational changes that could increase the effectiveness of its development assistance activities overall, especially as they relate to resource-poor farmers and herders. These include increased roles for field missions, funding longer projects, and strengthening its evaluation and information system. Past OTA work has identified a set of internal constraints that may undercut the benefits of these changes:

- The numbers and skills of AID's Africa staff are not commensurate with the U.S. commitment to Africa. Significant staff cuts in the 1980s have worsened the problem. Technical, local language, and cultural skills largely are lacking. High rates of turnover interrupt program continuity, make accountability difficult, and reduce institutional memory. Local staff are often underused.
- Program and project design systems tend to be slow and inflexible, and they tend to reward the project designer and obligator of funds rather than the successful implementor. Obligating funds can be quick but project implementation can be held up by paper requirements and procurement bottlenecks.
- Program and project monitoring is constrained by a small staff. Evaluation results may be too narrowly focused and ineffectively incorporated into the design process.

These constraints are well known. Some consider them to have worsened with time. Growing concern has led some observers to conclude that AID lacks the commitment to remedy these problems or is incapable of doing so and the best solution would be to restructure the provision of U.S. assistance substantially, to form a new development agency, or to transfer certain AID functions to other organizations. While OTA did not analyze the appropriateness of these options, current budget restrictions and difficulties in passing foreign assistance legislation suggest that such drastic changes are unlikely. Thus, resolving AID's constraints depends primarily on AID/Administration action.

Part of the problem is influence exerted by interests outside of AID (for example, political concerns of the U.S. Department of State, short-term economic interests of American exporters) that sometimes hamper development work, and Congress may wish to examine these competing pressures. Notwithstanding such external influences, AID has not been effective in resolving well-recognized internal problems. Congress could focus AID's attention on the need to address and provide support for internal reforms. If such reforms are not successful, then alternative, perhaps more extreme, options could be considered.

NOTE: Copies of the report "Enhancing Agriculture in Africa: A U.S. Role in Development Assistance" can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325, GPO stock No. 052-003-01092-5.

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NOTE: For brief descriptions of these studies in progress, see OTA's booklet on "Assessment Activities"—available from OTA's Publications Office, 224-8996.

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- *Grassroots Development: The African Development Foundation*, OTA-F-378 (Washington, DC: U.S. Government Printing Office, June 1988). GPO Stock No. 052-003-01109-3; price $8.50.

- *Continuing the Commitment: Agricultural Development in the Sahel*, OTA-F-308 (Washington, DC: U.S. Government Printing Office, August 1986). Out of print from GPO; NTIS Order No. PB 87-117 644/AS (available photocopied or in microfiche).

- *Africa Tomorrow: Issues in Technology, Agriculture, and Foreign Aid*, OTA-BP-F-31 (Washington, DC: U.S. Government Printing Office, December 1984). GPO Stock No. 052-003-00985-4; price $5.50.

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